

Pesticide Leaching Risk Assessment in the Tropics: Evaluation of the Windows Pesticide Screening Tool (WIN-PST) for Use in Hawaii

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Objective

Determine whether Hawaii NRCS should adopt the Windows Pesticide Screening Tool (WIN-PST) to assess pesticide leaching risk for Conservation Planning



Context

- NRCS Conservation Planners must now consider pesticide leaching risk in management planning where appropriate.
- Planners need an acceptable pesticide leaching risk assessment tool to assist them in their work.
- The Windows Pesticide Screening Tool (WIN-PST) is supported nationally but has not been validated for use on tropical soils like those found in Hawaii.
- A locally developed and validated leaching risk assessment model (the Comprehensive Leaching Risk Assessment System -- CLERS) is currently being used in Hawaii by the State of Hawaii Department of Agriculture (HDOA).

System scope

- WIN-PST has a larger database of chemicals and soils and provides more output information including an assessment of runoff risk.
- CLERS provides more flexibility to change chemical attributes.
- WIN-PST provides options to consider management practices and soil properties.

Consistency with Field Data

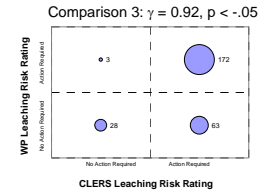
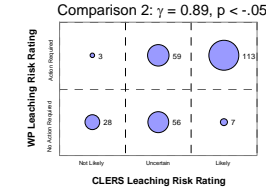
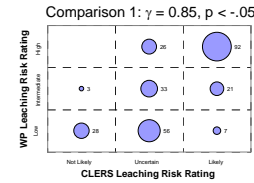
- Field study conducted for 5 chemicals: ametryn, atrazine, chlorpyrifos, fenamiphos and hexazinone on three soils: Hilo, Molokai, Wahiawa (Gavenda et. al., 1996)
- Predictions from both systems agreed with field data except for fenamiphos where both systems predicted that leaching was likely, but no leaching was found.
- However, a more detailed field study on fenamiphos (Schneider et. al., 1990) found evidence of leaching consistent with the risk assessments from both systems.

Pesticide	Soil Series	Leaching Risk Rating	
		WIN-PST	CLERS
Ametryn	Molokai Series	Intermediate	Uncertain
	Wahiawa Series	Intermediate	Uncertain
	Hilo Series	High	Intermediate
Atrazine	Molokai Series	High	High
	Wahiawa Series	High	High
	Hilo Series	Very High	High
Chlorpyrifos	Molokai Series	Low	Low
	Wahiawa Series	Low	Uncertain
	Hilo Series	Low	Uncertain
Fenamiphos	Molokai Series	Low	High
	Wahiawa Series	Low	High
	Hilo Series	Low	Uncertain
Hexazinone	Molokai Series	High	High
	Wahiawa Series	High	High
	Hilo Series	High	High

Since the Hilo soil was not included in CLERS, the Panei soil (also an Andisol) was substituted in this analysis.

Leaching Risk Assessments

WIN-PST and CLERS leaching risk assessments were significantly positively correlated for a sample set of 38 common pesticides and 7 agricultural soils.



WIN-PST Action Required → leaching risk rating of "very high", "high" or "intermediate"
CLERS Action Required → leaching risk of "likely" or "uncertain"

Conclusions and Recommendations

- Hawaii NRCS should adopt WIN-PST as the official pesticide leaching risk assessment tool for Conservation Planning.
- Hawaii NRCS technical staff should continue to work with the NRCS Water and Climate Center, the University of Hawaii, and members of the Tropical Technology Consortium to evaluate and improve the accuracy of WIN-PST in the tropics.
- Update WIN-PST soils database to reflect new soils information (especially the Island of Hawaii and in the Pacific Basin)
- Identify possible adjustments in input parameters to account for unique tropical conditions like deep organic matter in Andisols
- Assess the impact of intense, concentrated rainfall events on pesticide leaching including effects of macropore flow
- Identify and address other concerns and inconsistencies (knowledge gaps) as they appear through ongoing use of the system in the field

Soils and chemicals used in system comparisons

Keahua Series (Maui), Fine, kaolinitic, isothermic Typic Haplocombrids		Lahaina Series (Maui), Very-fine, kaolinitic, isothermic Rhodic Eutrustox		Molokai Series (Maui), Very-fine, kaolinitic, isothermic Typic Eutrustox		Panei Series (Maui), Medial, amorphic, isothermic Typic Haplostrude		Wahiawa Series (Maui), Very-fine, kaolinitic, isothermic Rhodic Haplostrude	
Wahiawa Series (Maui), Very-fine, mixed, superactive, isothermic Pachic Haplostrude		Chemical Name		Use		Chemical Name		Use	
2,4,5 T		Herbicide		Fenamiphos		Insecticide		Herbicide	
2,4 D		Herbicide		Glyphosate		Insecticide		Herbicide	
Aldicarb*		Insecticide		Hexazinone*		Insecticide		Herbicide	
Aldicarb sulfonide*		Insecticide		Lindane*		Insecticide		Herbicide	
Ametryn		Herbicide		Mallathion		Insecticide		Herbicide	
Anilazine*		Herbicide		Methomyl		Insecticide		Herbicide	
Atrazine		Herbicide		Methoxychlor		Insecticide		Herbicide	
Bromact*		Insecticide		Methyl bromide		Insecticide		Herbicide	
Captan*		Insecticide		Menthaquin*		Insecticide		Herbicide	
Carbendazim		Insecticide		Paraquat		Insecticide		Herbicide	
Chloridaz		Insecticide		Oxamyl		Insecticide		Herbicide	
Chlorpyrifos		Insecticide		Prometon		Herbicide		Herbicide	
Cyanazine*		Herbicide		Prometryn		Herbicide		Herbicide	
Cyanazine*		Herbicide		Propanil*		Herbicide		Herbicide	
Diflufenican		Herbicide		Simazine		Herbicide		Herbicide	
Diquat*		Herbicide		Tosamphen*		Insecticide		Herbicide	
EDB*		Insecticide		Trichlorfon		Insecticide		Herbicide	
Endosulfan*		Insecticide		Triclopyr		Herbicide		Herbicide	

*Chemicals that are not found in products registered for use in Hawaii in 2003 but were used in the past.

References

- Gavenda, R. T., R. E. Green and R. C. Schneider. 1996. Leaching of pesticides in selected Hawaii Oxisols and Andisols as influenced by soil profile characteristics. HITARR Research Series 075, University of Hawaii.
- Schneider, R. C., R. E. Green, W. J. Apt, D. P. Bartholomew and E. P. Caswell. 1990. Field movement and persistence of fenamiphos in drip-irrigated pineapple soils. Pesticide Science 30: 243-257.

